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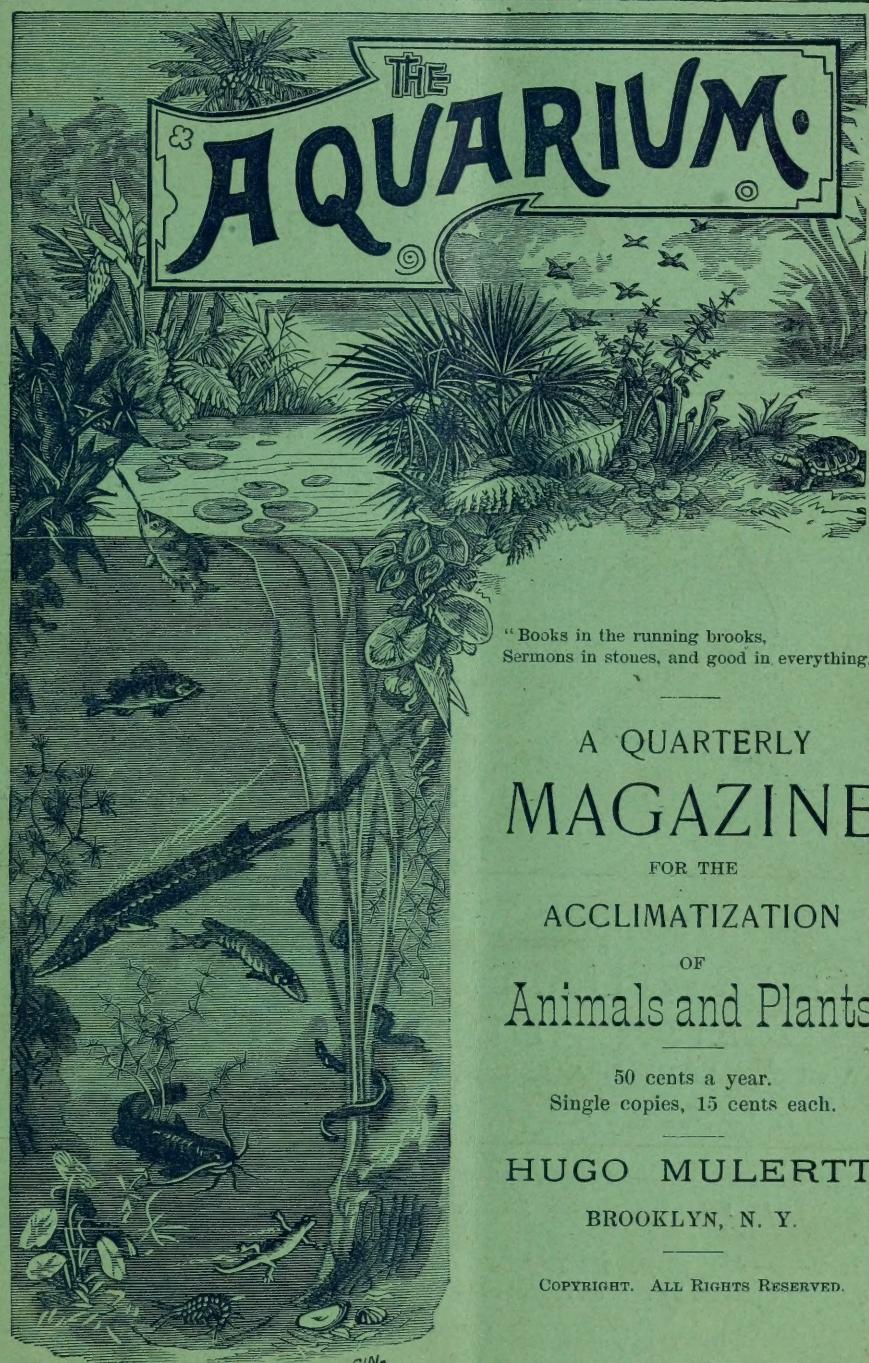
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Vol. III.

JANUARY, 1893.

No. 26.



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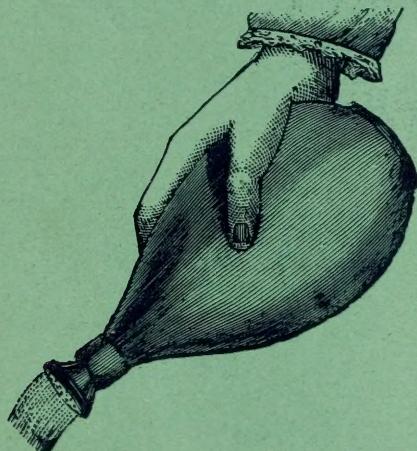
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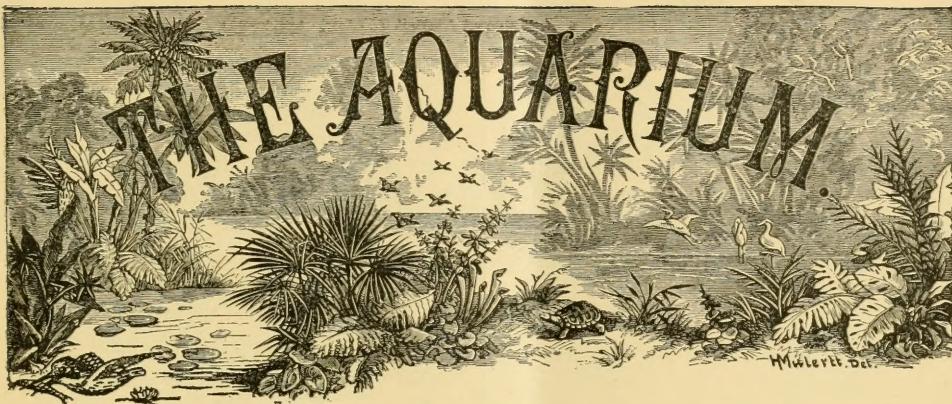
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THE PARLOR AQUARIUM.

We know of nothing more likely to stimulate the mind to healthy exertion, and take it out of the immediate track of common interests and pleasures, the monotony of which is so oppressive, than the study of natural history in some of its least explored fields, especially its extraordinary development in connection with the aquarium. And yet how few there are who seek that charming mode of dissipating the dreary monotony of every-day life, such as it is made by the routine of fashion or habit! A popular love of natural history, even in its best known divisions, is, in fact, of quite recent date. Indeed, the very existence of such a science has been, till recently, altogether ignored by our great national seats of learning. The earnest investigators, who have done so much to lay bare its wonders, were either ridiculed or treated with but small respect—as useless dreamers upon very small and insignificant matters. To appreciate Nature, as well as Art, the mind requires a special education, without which the eye and the ear perceive but little of the miracles passing before them. Each department

of science requires a separate and distinct kind of sight. Those who cannot *see* Nature, who cannot see more than a “funny thing” in a little polywog are like one gazing at a carved Egyptian record, who perceives, in the hieroglyphic character, simply the sculptured figure of a polywog, and no more—they are in a state of Egyptian darkness as regards one of the highest and most enchanting fields of human research.

When, however, the language of Nature is learned, and her voice is no longer a confused murmur to the ear, but becomes a brilliant series of eloquent words, full of deep and exquisite meaning, then the student will *see* as well as *hear*; but till then, in his intercourse with Nature, he is both deaf and blind. “*Speak,*” said Socrates to a youth; “*say something, that I may see you.*” Socrates saw not a silent man; and those who do not hear and understand Nature’s language cannot see her wondrous beauty.

The aquarium has been at all times and in all ages a source of information and amusement for the cultured and rich. Already, thousands of years ago,

the Chinese adorned their houses and gardens with aquariums, the old Egyptians and the noble Romans had theirs, in which they cultivated choice water-plants and fish. During the middle ages we find rare and beautiful fishes and aquatic plants in precious basins in the famous castles of Europe.

The aquarium of those days was of course quite different from the aquarium of the present. The manufacture of sheet-glass not being invented then, the tanks containing the collections were basins formed of costly stones or china, and the contents could only be viewed from above.

Whether the scientific principles upon which the success of an aquarium is based were already understood by the ancients, is not known and now hard to prove. At any rate, the present manner of sustaining an aquarium through the action of aquatic plants without change of water, is based on Ingenhauss's discovery, made in the second half of the eighteenth century that "*plants when exposed to the action of light emit an air which he announced as oxygen gas.*"

Fish inhale the oxygen contained in the water and exhale in turn a gas called carbonic acid gas, a very poisonous compound, this the plants inhale and appropriating the carbon to build up their own tissues, give off the oxygen again for the fish, so that this gas oxygen becomes but a carrier of carbon from the animal economy to that of the vegetable. When the sun shines on the plants in our aquarium, very often their leaves will be seen to be covered with an innumerable assemblage of minute globules of that gas, glistening like dew-drops upon grass.

Carbonic acid gas is heavier than oxygen. It is the same body that col-

lects in wells and in some of our mines and which is also given off from stoves, often causing disease and death. When this gas is present in too large a quantity the fish feel uncomfortable at the bottom, they go near the surface of the water and finally are forced to breathe the oxygen contained in the atmosphere.

This discovery, like many useful others was from year to year improved, and could these scientists of bygone days see the parlor aquarium of America to-day, inhabited with plants and animals from every zone of the globe, see fishes and amphibians bred in them, not solely by professionals, but likewise by lady amateurs, observe the joy it creates in the child, the invalid, or the sick in the bed chamber, they would justly feel proud, for they were unknowingly great benefactors to man.

An aquarium is also very beneficial in improving the sanitary condition of a living or bedroom through its purifying influence on the atmosphere. All the impurities of the air are absorbed by the water, this is in turn purified by the plants and the water evaporating into the room is perfectly pure.

As we have seen above, the foundation of an aquarium is the plant life. When one has concluded to get an aquarium into his house, the first thing that should be considered is the location of the tank.

The best side of a room for the aquarium is that having a window near which it is to be placed, as the light can be increased or reduced by regulating the shades accordingly. The best exposure is that towards the North; by such an exposure the aquarium should stand about six inches away from the window; next best is one



AFTER DINNER. (CHATEAU FONTAINEBLEAU, 16TH CENTURY.)

THE AQUARIUM,

JANUARY, 1893

towards the East, the best distance in such a case is about twelve inches from the window; next best is a window facing South or West, here set the aquarium about eighteen inches towards the room, and when the windows are high even more space may be left between.

When an aquarium is to be located between two windows, it should be far enough in the room to receive the light from both, and in a corner room with windows at both angles, the aquarium should be set diagonally so that the light from each window will enter the aquarium from each end.

But, although we want plenty of light for the plants, we should avoid as much as possible the sun. In winter allow all the sunshine you can get, but towards the spring, from February on, shelter the tank from its direct rays. The most favorable temperature for the welfare of the collection ranges between 60° and 90° F.

When we have chosen a place for the aquarium the next step is to secure a tank. The best tank is the rectangular one, metal frame with glass sides and ends and glass or slate lined bottom. This tank is placed on a stand-table or bracket of proportionate height to secure proper light for the plants and to allow an easy inspection of the contents.

When the tank is secured it is properly cleansed with clean water and a sponge, but without the aid of soap, and filled up *to the top* with water to test the resistance of the glass and to detect any leaks. In making this test the tank should be in a perfect level position, and of course not in a carpeted parlor.

Having stood the test it is now placed in its position, care being taken that it sets perfectly level. Now get

the washed rocks or tuff-stone intended for the rockery ready, put a sufficient quantity of well washed sharp sand on the bottom of the tank to cover it to the height of about one inch.

This done, seat yourself in a chair some distance away from the aquarium, look at it, and study the best effect regarding the arranging of the rocks. Don't be in too great a hurry; remember that this arrangement is to be for at least one season, and don't forget that you must make allowances for the plants, making as little shade for them in placing the rocks as possible. The arrangement of the rocks being completed, the next move is the planting of the plants. Since we know that these are the prime factors for the maintenance of the aquarium, this should be done with great care.

The plants may be well rooted specimens or mere cuttings, in either case handle them gently, do not bruise or break them. Plant them in the sand with the same care as you would a tender seedling-plant in your garden, arranging the different groups according to the picture you had made in your mind when you sat in the chair thinking about the rockery. An aquatic garden can be made a charming little sub-marine landscape, prettier than any picture. Be not 'close' when you make your selection of plants for the aquarium, it would be 'penny wisdom,' as the success of everything depends on them. They need not necessarily be expensive plants, some of the commoner species being excellent oxygenators, but since plants, outside of their purifying faculties, add greatly to the attractions of an aquarium, liberality in this direction is well placed.

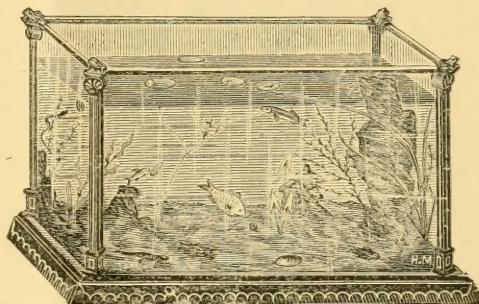
Whilst you are planting, sprinkle the plants every few minutes, so they may

not suffer from the dry air. All being planted, the next thing to do is to place some small stones or large pebbles in an *apparently* careless manner on the bottom, some in the immediate vicinity of the plants to steady the roots of them, while others are placed in groups of threes or fours together, leaving small crevices between each stone to catch the refuse matter that will collect in time.

The aquarium is now ready to receive the water. If you live in a city that has waterworks, use water from the hydrant, provided that it is clear; if you cannot have that, take clear cistern or spring water, but the water must be clear and fit for anybody to drink. Any water that you would not like to drink yourself is not fit for an aquarium! Muddy water is as detrimental to aquatic plants as dust is to garden plants. If the water is less than 60° F., some warm water should be added, as otherwise the plants would get chilled. Pour the water into the tank slowly and carefully, in order not to wash out the roots of the plants, filling it up to within two inches from the top. Now take a small stick, and by its aid carefully arrange the branches or blades of the plants to suit, then sprinkle a pinch of common table salt on the surface of the water and your aquarium is started.

If you wish to do so, you can place the fish in the water at once, but if there is no particular hurry, it is advisable to wait a day or two, in order to have the water settle and to give the plants a chance to straighten up and have the sand settled about their roots. After elapse of that period you will see most of the plants covered with minute silvery bubbles, these are oxygen bubbles and you may consider your tank charged

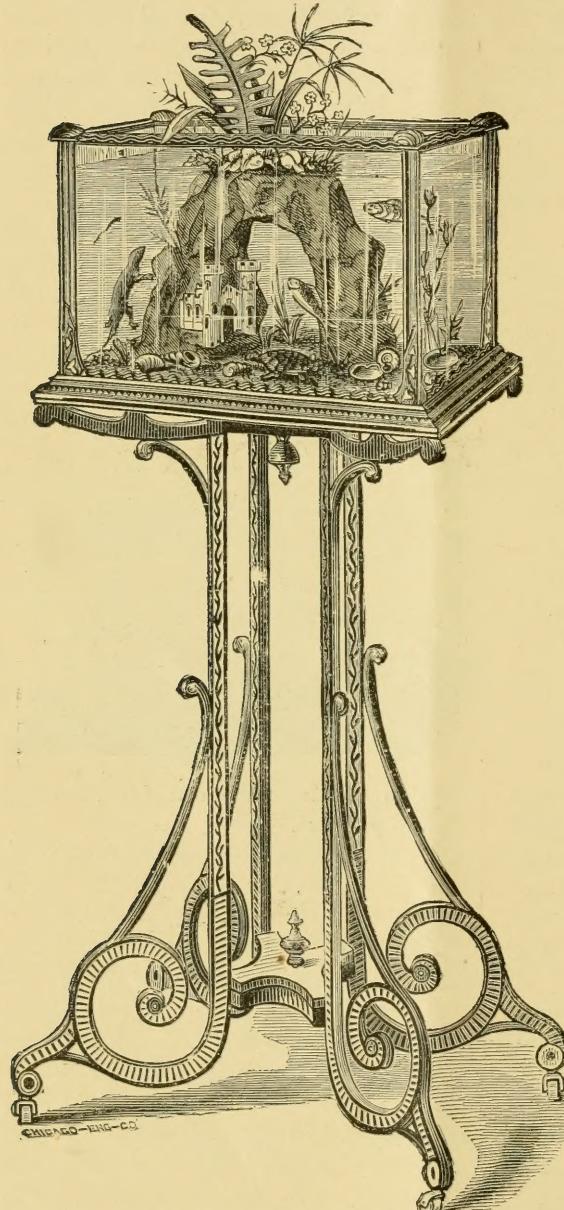
with same and in perfect condition to support animal life. Now take the wiper, which is a sponge fastened to the flat end of a stick, and slowly wipe the inside of the glass of the aquarium, making the motion up and down, avoid touching the sand as this would scratch the glass. The aquarium will now appear as clear as if it contained no water at all. Now introduce the fish gently, one at the time, getting them gradually used to the temperature of the water by slowly mixing it with the water in which they were, then add to your collection two or more frog tadpoles to consume the refuse and otherwise decaying matter and also a few pond



snails of the ramshorn type, for the same purpose.

The question, how many fish can live in an aquarium of a certain size, is equal to, how much money must a man have to be rich—the answer is substantially the same. The shape of the tank and the location in which it is placed determine the number of fish that can comfortably live in it. Should the location be bad as regards light, the amount of oxygen generated in the tank will be less, while if the situation is highly favorable in every respect, the evolution of the life-giving gas will reach its maximum degree. The quantity of water required for a given number of fish is furthermore regulated by

their size and the nature of the treatment they have received before they came into your possession. If, for in-



stance, they were kept in running water, or were newly caught in a large pond, they will naturally require a much larger quantity of water than if they

had already been accustomed to a life of captivity. Some fish need a great amount of oxygen while others get along with remarkably little. An aquarium will stand as many fish as the plants can supply with oxygen.

The only way to ascertain the ability of a tank is by beginning with a few specimens, adding from time to time until you see by the action of the fish that you have arrived at the limit.

Fish, in order to be objects of study or enjoyment, should above all things feel comfortable and happy; they must feel "at home," and it is much the better plan to keep only a few choice specimens (of a noble type and good habits) and make real pets of these, than to crowd the tank with indifferent stock.

For an aquarium holding from twelve to thirty gallons of water and kept for ornamental purposes, two handsome specimens of equal and proportioned sized sunfish, for instance, strawberry bass; or a pair of brook trout; or two gorgeous Japanese fringe tailgoldfish, make a striking effect. A similar good effect is obtained if such a tank is stocked with about five fish of different colors, shapes and sizes. Tanks of the author were seen by millions of people at the various industrial expositions during the last twenty years where we had them displayed and we had good opportunities to notice which arrangement was the most admired.

Such a tank as mentioned above brings the arrangement of the rockery and the plants to full notice. The fish appear like so many cattle in

a pasture with the edge of a piece of forest as a background. The whole is a living picture continually changing, but always charming. Its perfect silence rests our nerves and imparts a peaceful feeling.

If the aquarium is to be a source of information to children or pastime for invalids, a different course is to be taken and the collection should comprise various species of fish in order that the different forms, habits and structure may be compared and studied.

There now remain a few remarks to be said in regard to the general management of an aquarium. We say a few remarks, because if the aquarium has been properly started, it almost takes care of itself, all that is necessary is to feed the fish regularly every day. One person only should have charge of this, and the fish should be fed as nearly as possible at the same period. Allow for each fish a mouthful of food each feeding time. Should any unconsumed food remain at the bottom the tadpoles and snails will devour it. Once or twice a week the inside of the glass should be cleaned with the wiper, thus preventing algae covering it and obstructing the view. At the same time the water lost by evaporation should be replaced.

Once a month the sediment that has collected between the pebbles, introduced for this purpose, should be removed by the aid of a glass dipping tube or a rubber siphon.

When the aquarium is to be thoroughly cleaned and re-arranged, which should be done once or twice every year, the water is drawn off with a rubber siphon to within about six inches from the bottom (this water, if practicable, is saved and used again

when the tank is re-filled. The older the water, the better. The author has used water for eleven years in this way). Next take out the rockwork, then all the plants, also the larger pebbles, and now carefully catch and remove the fish, etc., placing them in a clean tin vessel with *plenty of water* of suitable temperature. Take out the balance of the water now and also the sand, but do not move the tank from its position. After washing the sand particles off the inside of the glass to prevent scratching, clean the entire inside of the tank by rubbing it with ordinary table salt, using the fingers instead of a brush. All the brownish or green matter being taken off, the tank is once more washed with clean water and is then ready again for re-planting.

The sand should be well washed in various waters until perfectly clean before it is put back into the tank. Where sand is easily obtained a new supply is preferable.

The rock work, or the rock used for it, should be scalded and then washed in salt water with a rough sponge or small scrubbing brush before replacing in position.

The plants are then looked over and the most desirable ones selected and planted again without delay; the tank refilled, and fish, etc., returned as soon as practicable.

Two or three hours of labor once or twice in a year—what a wealth of pleasure, information and pastime will they bring to a family circle, school room or hospital!

We cannot leave this chapter without calling attention to the old saying: “What is worth doing at all is worth doing well.”

THE AQUARIUM.

A QUARTERLY MAGAZINE.

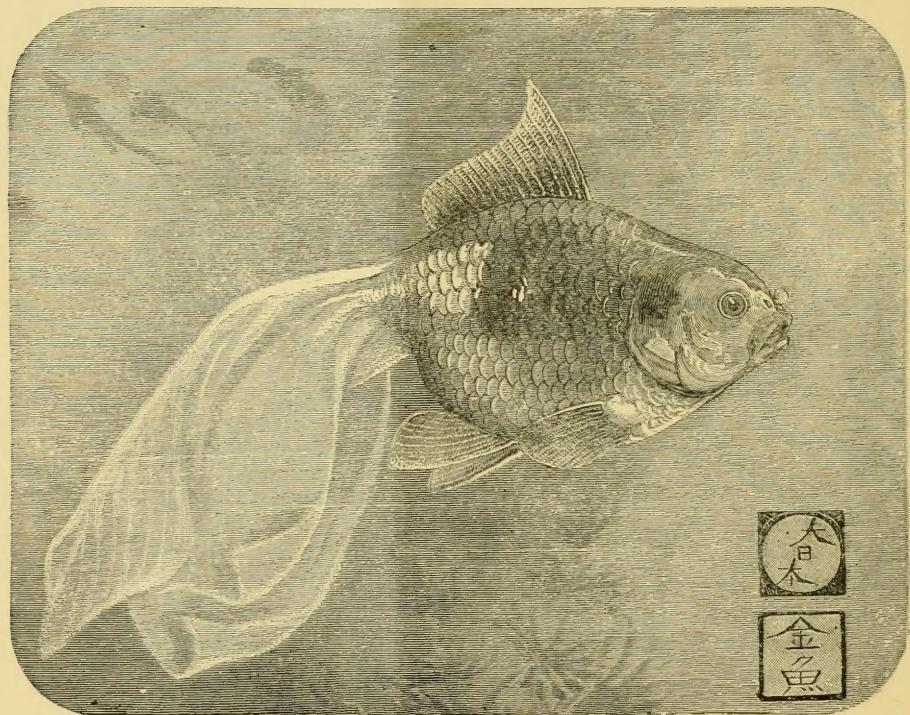
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Plants want plenty of light during the day and darkness at night; they want fresh air, and whenever there is a mild day the upper sash should be opened for them a little, for the air should not strike the plants directly, as this would chill them, nor should plants ever be permitted to stand in a draught, either in summer or winter. Also avoid a location where you would touch



JAPANESE FRINGE-TAIL GOLDFISH.

GENERAL MANAGEMENT OF HOUSE PLANTS.

The great secret of success in house gardening consists in overcoming, as much as possible, the disadvantages under which the plants labor, and rendering their position and treatment as much as possible like those growing in the open air.

the leaves of the plant frequently with your dress. Dusty air is fatal to plants.

Get good, healthy plants to begin with, keep not more than you can comfortably, and select plants according to facilities, regarding light and temperature, you have for them. For instance, a plant that requires shade will not flourish in a sunny window, and vice versa.

TEMPERATURE FOR HOUSE PLANTS.

The greatest success will be found to come from a uniform temperature of 45° or 50° F., at night, and 60° to 70° in the daytime; 80° is too hot except for only some plants of semi-tropical character. Under no circumstances should the temperature go below 35°.

PRECAUTION AGAINST DUST.

Dust and dryness of the atmosphere are the two greatest troubles of indoor flower-growing. The first is avoided by covering the plants with a light cloth while the room is being swept, and when it has accumulated it is removed by placing the pots in a sink or washtub, and showering the foliage with tepid water from a pot provided with a fine rose. The second is overcome to a certain extent by keeping water on the furnace or stove that heats the room if it be warmed by artificial heat. Open fires give but little trouble, while hot-air heaters are as unhealthy for plants as for man. Another plan recommended is to place the pots on clean sand kept constantly moist.

The sand may be spread to the depth of about two inches in a shallow zinc box of the size of the windowsill upon which the plants usually stand.

WHEN AND HOW TO WATER.

"When shall I water my plants?" is a vexed question, asked perhaps more frequently than any other by the beginner. This depends entirely upon the nature of the plant, for some need more water than others, and yet a soil thoroughly wet is totally unfit for plant growing. The real idea each cultivator should aim at is to supply the plants with water which may drain rapidly through the pots, yet sufficient being retained to give a good moist soil for the plant to live in. If the water passes

away rapidly it will need replacing frequently. It is generally a sign of health when the soil is well drained and the plant uses up the surplus of water quickly.

The purposes of watering should be better understood. First, water supplies to the roots fertilizing matter contained in itself; and, second, it converts the nourishment of the soil into a liquid form more readily fit for absorption by the roots. The roots can obtain it only when the soil is dampened.

Never give water when the soil is moist to the touch, but wait until it is dry.

The healthiest plants require water the most frequently, and yet it may appear a contradiction to say that the plants which contain the most watery tissues, the cacti, grow in the driest places.

Water cold from the well or pump is not suitable for plants, unless of a temperature of 60°. Rain water is best, for this is supposed to contain some little ammonia from the sky.

The best rule in all cases is to use water warm to the hand. Some florists advise water not colder than the atmosphere. We believe it generally best to use it warmer. In cool mornings it should be lukewarm, say not under 55°. Over 150° is neither necessary nor safe.

Nearly all plants require more when in flower than at any other time. The supply of water must be regulated according to the demand of the plants. Calla Lillies will absorb water two or three times as quickly as any other plant. If rain water cannot be easily obtained and hard water is the only source on hand, add a little soda to it and let it stand for awhile; use a small piece, say a small nugget of the

size of a pea, to every gallon, on that pour about a pint of boiling water, and then fill it up with cold water. It will be quite warm, and a thorough drenching overhead and in the pots will vastly improve their color and health. A drop or two of hartshorn will also correct hard water somewhat. In watering, never wet merely the surface, but moisten the whole ball of earth in the pot. If the ball should yet be very dry, set the whole pot in a pail of warm water till it is soaked through. The morning is the best time of the day for watering during the cold season, while the evening is best in summer. A common hand-brush, made of broomcorn, dipped into warm water and shaken over the plants will imitate a summer shower. Care should be taken that the pots have good drainage, for then all surplus water will run into the saucer, which may be emptied as fast as filled. In warm, mild weather, when plants absorb a great deal of moisture, it will do no harm to leave a little in the saucer. Among other details in watering, the following items of caution are to be observed: Some plants should never be wetted on the leaves. Take the Begonia Rex, whose foliage, so large and grand, has an exquisite coloring; if its leaves were to be sponged with cold water, and the plant left out on the balcony or in open air, it would probably die very soon, but a Camelia can be treated in the same way and not be injured in the slightest. The reasons for it are good. The last plant has a hard, shiny leaf, which can resist rough treatment; but the other has a succulent, tender leaf, easily affected. The novice, then, may generally find it true that the plants with soft, porous and hairy leaves should be very cautiously wetted over-

head, but plants with hard, varnished leaves may be watered frequently. Tepid water should be invariably used, even down to the height of summer. If plants get infested with vermin, a sponging with soap, as sold by the florists, and water made into a lather, will clear them. Then follow with clear water to remove the soap. It is also a good rule to observe that the colder the weather the less water must be given; and when plants are at rest, done growing, they need very little indeed.

Plants in cases may be watered once a week for there evaporation is confined, but in open rooms once a day is sufficient. Some plants, which delight in very moist situations, need it twice a day. Never water when the sun is hot.

TREATMENT OF FROZEN PLANTS.

During the cold spells our plants are liable to get "snapped" by "Jack Frost." In spite of our precaution in their behalf, some may be found frozen stiff in the morning.

If this happens, don't get discouraged. Take the frozen plants tenderly and dip them into cold water, as the cistern or hydrant furnishes it (or if the plant is too large for that, sprinkle it for a minute or two), then place them in complete darkness, and in three days at the most you will find them as fresh as ever.

If the pots are set back at night from the windows on a shelf, mantle or table, they will often escape freezing. Fastening a blanket or several thicknesses of paper against the windows outside will also tend to protect them.

A year's subscription for THE AQUARIUM will make a very pretty and interesting Christmas present for some of your friends.

THE CLIMBING PERCH.

The fresh waters of India and the islands of the adjoining archipelago, as well as those of Southern Africa, are inhabited by a family of fishes of more than usual interest, which is due not only to the food value of some of its members, but also to the singularity of their habits—their power of enduring a prolonged stay out of their native element. This family is known scientifically as the Anabantidae, or fishes with labyrinthiform branchiæ. The family name is derived from the generic designation of one of the chief genera, *Anabas*. The anabantids vary considerably in form and peculiarities of structure, but in general appearance resemble such of our fresh water fishes as the sunfishes, grass bass and black bass for instance. In other words they are oblong, laterally compressed fishes, covered with scales of moderate size with ventral fins thoracic, with the dorsal and anal fins with spines anteriorly and generally in large numbers, and with the uppermost element of the gill-bearing arches peculiarly modified; that is, the uppermost element of each side, instead of being straight and solid as in most fishes, is excessively developed, and provided with several thin plates or folds erect from the surface of the bone and from the roof of the skull to which the bone is attached. These plates by their intersection form chambers and are lined with a vascular membrane which is supplied with large blood vessels, and it was formerly supposed that the chamber referred to had the office of receiving and retaining supplies of water which should trickle down and keep the gills moist, and such was supposed to be the adaption for the sustentation of life out of water. Some experiments, however, tend to

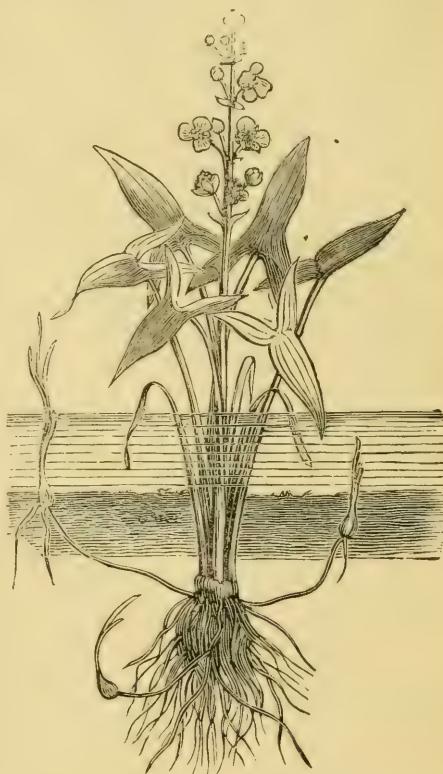
throw some doubt upon this alleged function. The climbing perch (*Anabas scandens*, Cuv. and Val.) is perhaps one of the best known species of this family of fishes, and inhabits the fresh waters of India, Malaysia, and the Philippine Islands. This fish has an oblong and slightly compressed body, with a rounded head and inflated cheeks and gullet. It is of a rifle green color, lighter in the abdomen, with four dark vertical diffused bands passing from the back to the abdomen. In the young fish a dark spot is generally present at the base of the tail. The fins are dark green, but in clear water tend to become reddish. As to its habits, Dr. Francis Day, in the "Fishes of Malabar," says that the climbing qualities attributed to it in other parts of India and Ceylon are fully believed in by the inhabitants of Malabar. It is certainly with difficulty, says he, that they can be retained in an aquarium since, unless it is covered, or its summit is upward of a foot above the water, they invariably escape. They are able to progress along the ground in two ways; either by lying flat on their sides, flapping their tails, moving their pectoral fins, or else chiefly by the aid of the latter fins—first one being advanced and then the other. They can erect their fins and likewise their scales at pleasure, even down to those along the basis of the caudal fin. This power of erection, especially as it also exists in the gill covers, would be of great assistance did they employ the latter in climbing. The hollow super-bronchial organ, with from two to six laminal (the number of which depend on the age of the specimen,) with fringed valances, enables the "climbing perch" to retain water for a considerable time, so that it can moisten its gills and live

awhile out of its native element. Hamilton Buchannan observes that he has known it to retain vitality under these conditions for six days. That it travels from pond to pond when its means of subsistence fail is a well known fact; but that it buries itself in the mud as tanks dry up, and remain there until the monsoon of the next year fills them with water is a statement that requires further research before it can be accepted. These fishes being common in most pieces of fresh water in Malabar, and being esteemed good eating by the natives, are much fished for. The natives when catching them invariably bite their head to destroy life. On one occasion, says Surgeon Day, this practice led to a fatal result, the fish having slipped down the throat of the fisherman it could not be withdrawn, owing to the erectile nature of the gill covers and scales, and the man died of suffocation before reaching the hospital.

THE SAGITTARIA OR ARROW-HEAD.

In the great economy of Nature the sagittaria have contributed their full share to the support of the human family in all parts of the world. The Chinese and Japanese cultivate them very extensively for food, also the Tartar Kalmucks use them for food. Aquatic birds are fond of them, and resort to favorite spots in spring to feast upon the tubers, when the Indians slay the birds for their own feasts. The tubers are generally as large as hens' eggs, and are greatly relished when raw, but have a bitter, milky juice, not agreeable to civilized man; this is destroyed in boiling, however, and the roots are rendered sweet and palatable. They are considered excellent when

cooked with meat, either salt or fresh. To collect the roots the Indians wade into the water and loosen them with their feet, when they float up and are gathered. They are of an oblong shape, in color whitish yellow, banded with four black rings (U. S. Agr. Rept., 1870). They serve as food for the Indians of Washington, under the name of Wappatoo. In shallow ponds and



THE ARROW HEAD.

muddy margins of lakes and rivers throughout the Northwest this plant, so variable in foliage and so abundant in distribution, furnishes an important article of native food in the tubers which beset its fibrous roots. These tubers, from the fact of their affording nourishment to the larger aquatic fowls which congregate in such abundance about the Northwestern lakes, are

called by the Chippewas Wab-esi-pining or swan potatoes, a name which has been naturally appropriated to several streams in that region. Wabesipinicon, meaning the abode of the swan potato (Owen's Survey of the N. W.).

From the foregoing extracts it will be seen how universally they have been employed to assist in the maintenance of the human family, and probably we know very little yet how extensively they have been employed in North America.

We have collected them from a great many localities in Ohio, Indiana and Illinois, and find in early spring a solid, brittle, tuberous corm, down deep in the earth, being the germ from which the plant starts in spring. From the corm, at the first approach of warm weather, starts a large, porous root-stock, reaching up to near the surface of the earth, and there throws out innumerable fibrous roots, which is the true crown from which spring the leaves, flowers and stolons, and is also the plant centre during summer. By the 1st of June the milky juice (starch or saccharine, etc.) has usually been absorbed by the new growth of the plant, and the corm is then a soft and flexible, or spongy mass, reminding one of a sprouted and growing potato, while by the middle of July or 1st of August we would not find any corm, but found decayed masses which we were reasonably certain were the remains of the former corms.

In addition to tuberous and fibrous roots, the sagittaria present the feature of producing *stolons* or long, creeping roots, just below the surface of the earth. They start from the stem, and usually from just above the fibrous roots, and creep out horizontally from the plant in all directions. We do not

now recall a single genus of plants that present so many different forms of development in each plant as the sagittaria. First, the roots are of three entirely distinct forms, the tuberous, fibrous and stoloniferous. Next, the leaves are sometimes phyllodic (submerged and riband-like), others are an elliptical, erect blade, upon a tall, round, or slightly angular stem, and lastly, the leaf developed into its true form—arrow-shaped. Again, let us look at the flower; the lower ones are usually fertile, producing seed to perpetuate its kind, while the upper ones are sterile and barren, or each flower stock producing bowers with the sexes separate and still on the same stock.

The flowers are borne on long, leafless, branched stems, well above the foliage, with pure white petals and a yellow centre (stamens), usually single, but occasionally *S. sagittaeifolia* and *S. variabilis*, var. *latifolia*, have been found growing wild with double flowers. European nurserymen offer these varieties now for sale.

Sagittaria natans and *S. lanciolata* soon became favorites of American and European aquarists. For growing in an aquarium we find few plants better suited, and for a fountain, small lake or pond, it has few equals. In their natural condition they are found growing in soft, muddy or sandy ground, consequently the conditions for a successful cultivation must be continued, viz.: grown in soft, loamy soil, while, if for pot or tub culture, a layer of coarse sand or small pebbles in the bottom of the tub is always desirable for all kinds of aquatic plants; at the same time a layer of clean, fine sand, spread over the top of the soil, not only looks bright and cheerful, but very materially assists in purifying the water. Of

course the tropical species will not withstand our winter, but must be protected the same as other tropical plants, but they can be allowed to remain in a neglected corner until required again for the lawn or show house. The *S. sinensis* is of very easy culture; it may be grown either way, in water, moss or soil. If treated like the Chinese narcissus—grown in a bowl of water—it makes a very graceful and attractive specimen within a few weeks after it is planted.

THE TERRARIUM OR FERN CASE.

Every one who has had experience with the glass shade fernery or the Wardian case, will have found that they give very little or no satisfaction. The history of the Wardian case dates back to 1829, when a gentleman by the name of Ward, of London, first noticed accidentally the growth of vegetation under a closed glass. He had placed the chrysalis of an insect, with some mould, in a glass bottle and covered it over. A short time afterward, as he describes it, “a speck or two of vegetation appeared on the surface of the mould, and to his surprise turned out to be a fern and a grass. His interest was awakened; he placed the bottle in a favorable situation and found that the plants continued to grow and maintain a healthy appearance.” This was the first idea of the Wardian case, and a very good one, to preserve the plants for the scientist for a short time. But when it comes to practical use for the amateur, who wishes to see the various ferns and ornamental foliage plants put forth their beautiful leaves, it is a failure. He will do well if he preserves the old leaves the plants already have

when introduced into the case, the new growth will be slender and sickly looking. But suppose the plants are in a fair condition, they are concealed under the sweating glass shade, like gold fish are in a globe filled with muddy water. Is it not but half the pleasure of growing plants, when you can not work 'round them, pick away a leaf you don't like, and train another one in a desired direction? All this is prevented when your plants are in a closed case whether it is a round or a square one.

In constructing a practical fern case, or terrarium, as we shall call it in contradistinction to an aquarium, we were guided by the following points. 1. Plants, with few exceptions, must be protected against sudden changes of temperature, draught, dust, and too dry an atmosphere. 2. They must be supplied with fresh air and moisture, both to their roots and over their foliage. Our case is constructed as follows:

An oblong wooden base is lined with a zinc pan three inches deep, with a hole in the centre for drainage. The top glass, which is adjustable for ventilation, is in a frame, and this is supported at each corner by a thin iron rod, twelve inches or more, over the bottom part. The glass on the sides and ends is loosely fastened, without putty, in the grooves between top and bottom. The good fitting edges of the glass still admit a slight circulation of air. The glass that forms the front can be slid up through the top, thus forming a handy door.

To admit circulation of the warm room atmosphere, the whole case is raised by four two-inch balls, which serve as legs, over the surface of the table. This simple structure furnishes all the necessary protection most plants need.

In arranging such a terrarium even landscape gardening can be indulged in. A little lake can be formed by means of a shallow bowl or birds' bath, over which a little rustic bridge can be built. Rockwork can be formed with pieces of tuffstone, which lycopodium freely decorates, and to liven up the scenery, tree frogs, newts, salamanders, lizards and very small turtles are the things. The management of such a terrarium is pleasant and simple. Through the sliding door you are able to sprinkle the plants when necessary, to pick out imperfect leaves, or to place some cut flowers, that you value highly, in the small lake for longer preservation.

In cold evenings, before the fire goes down, close the ventilation, and cover the case with a pasteboard box made for the purpose or a thick cloth, thus affording shelter against the colder night air and the injurious, unnatural light.

HEATING AN AQUARIUM.

We received the following communication :

"I have contrived a device for warming the water in the tank where my paradise fish are. It is simple and effective. I will describe it, but you may have better ways.

"It consists of what you might call an ordinary can, without a lid ; it is made of tinned copper, it projects about a half inch above the aquarium frame in order to carry off any unpleasant odor from the lamp. The can is ten inches high, three inches wide, and four inches long, shaped similar to a wash boiler. Through this can, at a height of about three and a half or four inches, or so as to be about the centre of the water contained in the aquarium, a hollow (half

inch diameter) brass tube crosses ; the joints are water-tight. In this can, directly under this tube, I place a very small night lamp, and if more heat is required, I use an alcohol lamp, using wood alcohol, which is cheaper. I find the scheme works well. The small night lamp, filled with kerosene (high test), was left in all night. The temperature was kept well up to 70° ; of course in colder weather the heat will have to be increased. This can is held down by wires which spring under the top frame, being soldered to the corners of the can. Some little boys described the can, which excites some curiosity, being in the store window, as a place for the fish to sleep at night. Perhaps the above is nothing new or of value to you, and if it is and you would like any plainer description of it, I will have a friend of mine picture it for you. Another time I would build it in a rockwork.

S. M. S."

Our way to heat an aquarium is as follows : A sheet-iron pan, similar to an ordinary roasting pan, and about one half inch larger all round, outside measurement, than the bottom of the tank which is to be heated, is filled with two inches of sand ; on this the aquarium is placed. The whole is set on a framework, or on an open top-table. Under the pan, on a shelf, a small petroleum lamp, of the kind often used in cigar stores, with two burners, and each with a chimney, is set. After the aquarium has been put in order and filled with water of 80° F., the two lamps are lighted and kept burning until you find that the sand has become quite warm, and the temperature of the water, which was sinking, is beginning to rise again. When the water is again between 70° and 80° F., you may put

out one lamp, as one is generally sufficient to keep up this temperature during the daytime when the room is heated by a stove or open fire. At night, however, when the fire is out, and in severely cold weather, also in the daytime, the two lamps are necessary. We have kept the water of an eight gallon aquarium at 70° F. without difficulty when the thermometer outside stood 23° F. below zero, and the temperature of the room could not be raised above 60° F. The expense for oil will amount to about five cents a week.



We cheerfully answer, at once, all queries made in regard to Aquariums or Window Gardening if return postage is enclosed, and publish only such answers in this column as may be of general interest.

Miss L.—We advise you to leave the "odd little crawfish" out of your aquarium, as they are very destructive to plants, and in case one should die, will poison the water in a few hours time. You can keep them by themselves in a glass jar, but don't forget to feed them with a small piece of beef occasionally, otherwise they will eat each other.

Mrs. W.—Geraniums can be wintered over in a damp cellar successfully by hanging them up by the roots. If the plants are in pots, they can be hung up with the pot, in the same manner.

Mrs. W.—RD.—We would put those beautiful sea-shells on the mantelpiece

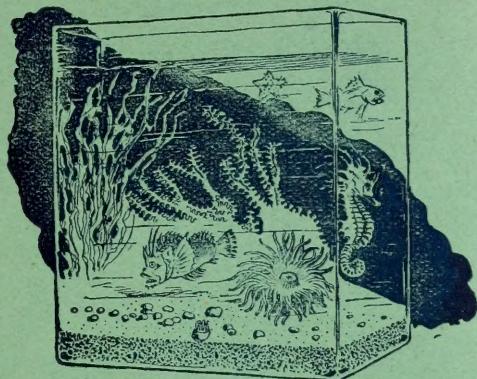
and admire them there. Sea-shells do not belong into a fresh-water aquarium; it is not natural.

MISS EMILY S.—A floating island for an aquarium is constructed as follows: Take a piece of rough cork bark, as it can be bought at any drug store, say of about two and a half by six inches. Mix common garden soil with watercress and canary seed, and with this mixture fill up the cracks on the rough side of the cork wood. Now place it on the water, the rough side upward. In a very short time the seeds will grow and present a charming appearance, especially when the watercress is large enough to droop over the edge of the "island" and hang into the water. The effect can be improved by placing a miniature fisher-hut or a swan-house on the island.

J. S. P.—Small bullfrogs will prove fatal in an aquarium. A small frog which we raised from a tadpole, swallowed a goldfish of fully twice its own size; the tail part stuck out of its mouth, hence the discovery. Frogs are only good for aquaria in their tadpole state, and after that should be inhabitants of the terrarium.

MISS B. E.—You are right; it is the canary bird that causes your trouble. A bird in a cage over an aquarium will never do. We would hang a basket of plants in its place.

In the *Spring Number* of THE AQUARIUM, which will appear in the first part of March, we will begin a series of papers on the Denominative Characteristics of American Fishes, Salamanders and their Breeding Habits, Aquatic Plants in their Homes and Ours, and Garden Topics.



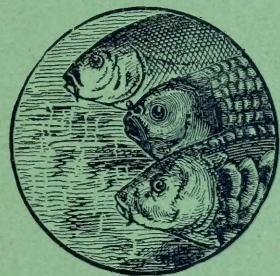
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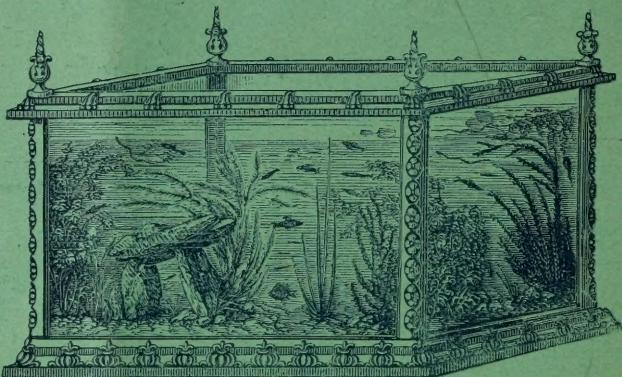
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